1930 MARINE DEVELOPMENTS

By H. C. COLEMAN, '16
Manager, Marine Engr. Dept., Westinghouse Electric Co.

The year 1930 takes its place in marine history of the United States with a record of activity, progress, and accomplishment in shipbuilding and marine engineering which has not been approached since the busy days of the World War. This is due largely to the stimulation resulting from the Jones-White Merchant Marine act of 1928, which has made available to American ship operators not only large mail contracts but also loans at low interest rates for construction of new vessels.

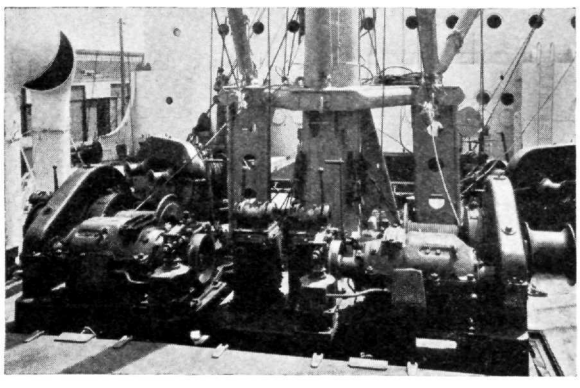
In the design of these vessels electricity has taken an outstanding place. Some will be electrically propelled. All will have electrically driven auxiliaries.

THE "PRESIDENT HOOVER"

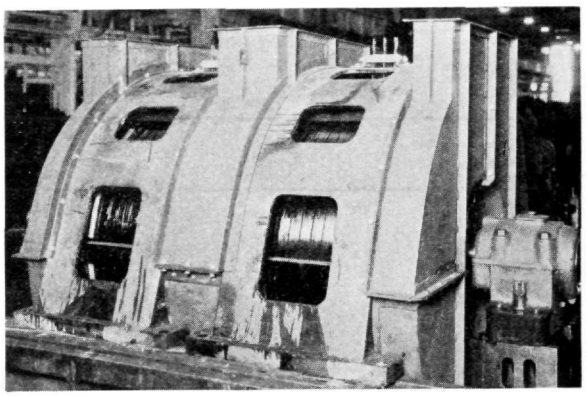
During 1930, the machinery for the new Dollar liner, "President Hoover," was completed and shipped. This included turbine electrical propulsion machinery and complete auxiliary equipment.

This fine new passenger and cargo vessel, which is being built at Newport News, is to be driven by twin screws, each directly connected to a 13,000 h. p., 4,000 volt, 3 phase, 44.3 cycle, 133 r. p. m., synchronous motor. The motors will be supplied with power from two 12,200 kw. 2,660 r. p. m., turbine generator sets, the turbines being designed for 275 lbs. throttle pressure, 200° F. superheat, and 28½" vacuum. The main control will utilize mechanically operated air-brake contactors and will be arranged so that all operations, including turbine speed control and set-up connections for operating both motors from either generator alone, will be controlled from the station in front of the instrument panel. Power for excitation and auxiliaries will be furnished by four 500 kw. 240/120 volt d-c., turbine generator sets, of new high efficiency light weight design. All auxiliaries will be electrically driven, except boiler feed pumps and main lubricating oil pumps.

The main turbines for this ship are provided with the oil impeller governor which is supplied with oil by a centrifugal oil pump, which also supplies the lubricating system. This turbine is also fitted with a solid forged rotor, a construction which has been applied on several hundred turbines in service ashore and which, because of its inherent sturdiness and stability of balance, deserves to be universally adopted for marine service. This ship is equipped with propeller type blowers for main motor ventilation.



Westinghouse-powered, high-speed Cargo Winches on "Morro Castle"



Shop View of 1500 Hp. Main Pump Motor Installed in Steamer "J. R. Sensibar"

These vessels are the largest ever built in this country with turbine electric propulsion, the total propulsion for each ship being 26,500 s.h.p.

NEW COAST GUARD VESSELS

During 1930 four new Coast Guard cutters built by the General Engineering & Dry Dock Company, Alameda, Calif., have been placed in service. These vessels have turbine electric propulsion plants and complete electric auxiliaries supplied with power from two alternating current auxiliary turbine generator sets. The propulsion plant on each vessel includes a single main turbine generator unit and a 3,200 h.p. synchronous motor.

The main motors of these Coast Guard cutters are ventilated by means of propeller type blowers, and another development in the field of fluid flow has been applied in the furnishing of Louvre vents of a design which materially increases the effectiveness of the ships' ventilation system.

These vessels are of the same size and design as the five previous ships of the "Chelan" class, three of which were completed in 1928, and two in 1929. Thus the Coast Guard now has a fleet of nine turbine electrically propelled cutters. The tenth and last cutter of this series is now being built at the Staten Island plant of the United Dry Docks Company, New York City. This ship is to have the same type of propelling and auxiliary plant as the four completed this year. This is the largest fleet of duplicate turbine electrically propelled vessels in the world.

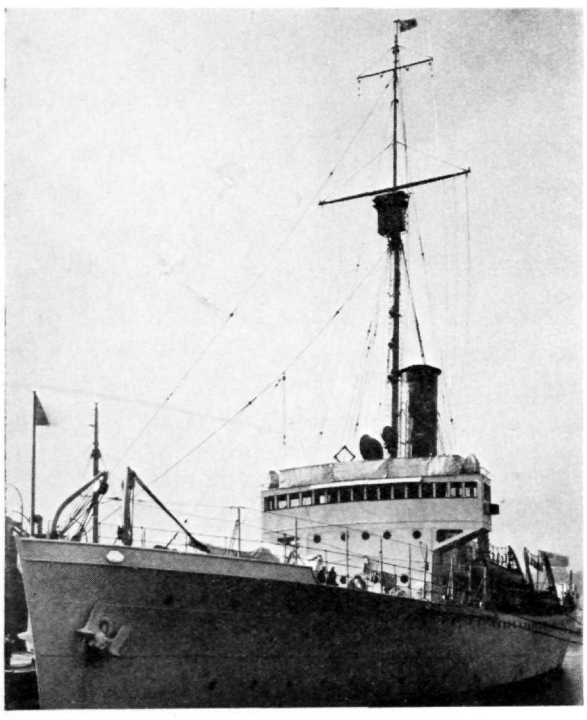
GREAT LAKES TUG

An order has been placed recently for geared turbine propelling machinery for a large tug for general lakes service. An interesting feature of

this vessel will be that the entire machinery installation including all auxiliaries will be furnished and serviced by the turbine manufacturer. It is expected that performance of this apparatus will give concrete evidence of the value of unified responsibility in the design of machinery for ships.

MISSISSIPPI RIVER BOATS

The turbine electric system of propulsion has been applied now on our inland waterways. The pioneer installation of this form of drive on a river towboat has now been made, and two boats so equipped are in service on the Mississippi River. These towboats are the "Indiana" and "Louisiana," owned by the Mississippi Valley Barge Line Company in freight service between New Orleans and Cincinnati. Each towboat is equipped with 2,000 s.h.p. twin screw, turbine electric drive, utilizing a single main turbine driving a double unit direct-current generator and exciter. Coupled to each propeller is a double unit, 1,000 h.p. 185 r.p.m. motor. Complete pilot house control is provided with individual control of the screws. In addition, it is fitted with the usual engine room control station. The combination of the high-speed turbine as prime mover with direct-current electrical equipment, provides an economical propelling plant as well as one which gives the necessary flexibility and ease and simplicity of control so desirable in a boat which must be maneuvered almost constantly as is true of towboats handling large numbers of barges on the rivers. These two boats are also completely fitted with electric auxiliaries which are supplied with power, when the boat is under way, from the exciter driven by the main turbine. The main turbine is equipped with the ejector lubricating system. The condenser is of welded construction, and the circulating pump is of the propeller type with reversible motor drive to provide for cleaning the suction screws.



Tenth Coast Guard Cutter to have Westinghouse Turbine Electric Drive

NEW DREDGE "J. R. SENSIBAR"

A very interesting and new type of ship was completed in November on the Great Lakes. This is the self-propelled, self-loading sand and gravel dredge and cargo carrier "J. R. Sensibar." This vessel was formerly a Great Lakes bulk cargo carrier of the usual type and about 600 ft. in length. Under the direction of C. R. Fisher, consulting engineer for the Construction Materials Corporation, Chicago, owners, the vessel was converted by the American Shipbuilding Company to electric drive with complete electrification of the cargo handling equipment. The propulsion plant consists of a single main turbine generator unit and a 3,000 h.p., 100 r.p.m., wound rotor induction motor and control station. This equipment was built originally for use on Shipping Board vessels of the class to which belong the "Archer," "Invincible," etc. The equipment, which was never installed on those ships, was kept in storage until its purchase for use on this vessel.

All of the remainder of the electrical equipment on this ship is new and was designed for the particular applications involved. The most important item probably is that comprising the main pumping equipment used for dredging sand and gravel. This consists of two 30″ centrifugal pumps of 30,000 gallons per minute capacity. Each of these pumps is driven by a double unit, 1,500 h.p., 2,200 volt, 415 r.p.m. induction motor. These motors are to be supplied with power from the propulsion generator. In addition to the large pump units, there are 16 motors and controls varying from 250 h.p. to 20 h.p. in size. These motors are utilized for driving the jet pumps, various engine room auxiliaries, and the conveyor systems. Transformers are provided for supplying low voltage power for lighting. A separate auxiliary turbine generator set with a 750 kv-a generator and a 75 kw., 125 volt direct-current generator may be used to supply auxiliary power. The dredge is so laid out that it may be unloaded by using the main pumps to pump out the hold, or the dry method may be used, in which case the material is fed through hoppers in the bottom of the hold to the conveyor. The material is carried on this conveyor to the forward end of the vessel, where it is discharged to an inclined conveyor which carries it to a long boom on which is mounted another conveyor to move the material to the dock. With this arrangement, a pile as high as 68 feet can be discharged on the dock. Because of the modern equipment and the size of this vessel, it will be able to handle a very large amount of sand and gravel. It is so designed that it may be used to carry other bulk materials if desired, such as limestone, coal, etc.

"SUSAN V. LUCKENBACH" INSTALLATION

An exhaust turbine of approximately 1,000 s.h.p. capacity permanently geared to the propeller shaft has been installed and placed in satisfactory operation on the steamship "Susan V. Luckenbach." In the case of a turbine so connected, it is obvious that provision must be made for astern operation. This has been accomplished by means of an ingenious application of the hydraulic relay in connection with an oil impeller governor on the turbine.

(Continued on Page 16)

1930 MARINE DEVELOPMENTS

(Continued from Page 5)

At the outset of this development it was recognized that the reduction gear would be required to absorb some torsional effects due to the variation in torque during each revolution of the reciprocating engine, but upon actual trial of the vessel after installation it was found that the variations in torque were of much greater magnitude than had been originally estimated, investigation showing that this was the result of the redistribution of work among the cylinders of the engine consequent upon a change in the back pressure on the low pressure cylinder. This phase of the problem was solved by the provision of torsional flexibility in the low speed gear.

DIESEL ELECTRIC YACHT

The first steel power yacht to be equipped with the Diesel electric system of propulsion is now being built at the yards of the Bath Iron Works, Bath, Maine, to the order of George M. Pynchon, New York, and will be 143 ft. long, with beam of 25 ft., and full speed of approximately 14 knots. It will be propelled by two 330 h.p., direct-current motors on twin screws supplied with power from two 400 h.p. Diesel engine generator sets.

HIGH SPEED WINCH INSTALLATIONS

The high-speed cargo winch motor and control combination which was developed during the latter part of 1928 and 1929 in connection with the Shipping Board Diesel program has found useful application on a number of vessels. The most important ships which have been so equipped, or for which such equipment is now being built, include the Alaska Steamship Company vessel "Aleutian," formerly the "Mexico," which has six 40 h.p., high-speed winches; the motorship "City of New York," which has twelve 25 h.p. and two 35 h.p. winches; a new motorship being fitted out by the Ford Motor Company, which has eight 25 h.p. winches; and the two new cabin liners being constructed for the United States Lines, each of which is to have tweity-two 35-h.p., high-speed winches.

(Continued on Page 20)

1930 MARINE DEVELOPMENTS

(Continued from Page 16)

CONDENSERS

European shipbuilders have for a number of years widely employed underneath condensers in their ship installations. This location was chosen for the condensers in the U. S. Collier "Neptune," the pioneer large-ship geared turbine installation, and the last is the development of a design, made practicable by welding, in which the condenser serves as the foundation for the turbine, resulting in an important saving in weight and simplification of the space disposition in the ship.

In addition, the first systematic theoretical analysis of the fluid-flow problem of scoop injection has shown that properly designed scoops may advantageously be applied to practically all classes of passenger vessels. In such installations the main circulating pump would be eliminated and the stand-by circulator would be a propeller pump located in the intake elbow and hence requiring no additional floor space.

From the standpoint of the watch engineer, whose opinion of his machinery installation is not infrequently translated in terms of dollars of maintenance spent or saved, it is ofttimes the small thing that means most. Such matters as gland leakage and a hot vapor-filled engine room, or the type of maneuvering gear furnished, are sometimes of great importance.

For vessels which normally steam at full power over long sea voyages, the combined water-and-steam sealing gland with automatic change-over valve is still the best device available. However, for those applications where carbon ring, or other steam-sealed packing is most suitable, it is important to provide adequate means for removing and condensing the vapor which inevitably leaks out of the glands.

This is commonly done by means of exhauster fans and vapor condensers, which take care of the vapor adequately but in a rather complicated and inefficient manner. Much simpler and less expensive means are now available in the form of a hydraulic ejector system employing condensate at boiler feed pressure and delivering to the air ejector after condenser. The amount of water required is relatively small, and no motors or fans are needed, with the result that much space is saved and the vapor removal is more economically accomplished.

Various combinations of valves for maneuvering, with or without interlocking devices, have been in use on turbine propelled vessels for years, but the introduction of the oil impeller governing system has made possible a great improvement in this type of valve, in that it is now possible to combine the functions of governor valve and maneuvering valve in one mechanism which not only permits rapid and practically effortless handling of the largest units but also allows the

(Continued on Page 22)

1930 MARINE DEVELOPMENTS

(Continued from Page 20)

operator to set the engine revolutions by means of the governor control. When so set it is not necessary to stand by the throttle even in the roughest weather, for the established turbine speed cannot be exceeded even should propeller or shaft breakage remove the load entirely.

These developments represent a real and important contribution toward the maintenance of that supremacy in shipbuilding which began in the days of the wooden clipper ship and which has persisted in the face of indifference and discouragement while awaiting the renaissance of the American Merchant Marine.
